

Enhancing Knowledge and Skills in Identifying the Transition from Primary to Permanent teeth: A Preventive Measure Against Tooth Crowding

Tita Ratya Utari^{1*}, *Trianita Lydianna*², *Sartika Puspita*³, *Cristina Mahardika*⁴, and *Nevlein Syavira*⁵

¹Department of Orthodontics, Faculty of Dentistry, 55183 Universitas Muhammadiyah Yogyakarta, Indonesia

²Department of Pediatric Dentistry, Faculty of Dentistry, 55183 Universitas Muhammadiyah Yogyakarta, Indonesia

³Department of Oral Biology, Faculty of Dentistry, 55183 Universitas Muhammadiyah Yogyakarta, Indonesia

⁴Faculty of Dentistry, 50273 Universitas Muhammadiyah Semarang, Indonesia

⁵Dentistry Study Program, Faculty of Dentistry, 55183 Universitas Muhammadiyah Yogyakarta, Indonesia

Abstract. Knowledge about the transition process from primary teeth to permanent teeth is crucial. Parents are expected to know when deciduous teeth will erupt, will fall out, and when permanent teeth will grow to replace primary teeth. In this way, permanent teeth will grow in the right place, thereby preventing crowding of teeth, which will become difficult to clean, causing cavities and gum damage. This community service activity aimed to increase knowledge by providing education and skills in detecting the process of changing primary to permanent teeth. The method used was promotive and preventive efforts through outreach to the community. Forty-two teenagers and young parents in Botokan Hamlet, attended educational activities using PowerPoint presentations accompanied by interesting pictures and videos. Before and after activity, participants worked on ten pre and post-test questions. To make it easier for the public to remember the material presented, leaflets and pocketbooks were distributed regarding the process of changing primary teeth to permanent teeth. The t-test results revealed significant differences, which means that this activity effectively increased knowledge and skills. Parents' knowledge and their ability to monitor the teeth transition process will provide enormous benefits for their children's dental health, thereby preventing unexpected tooth decay.

1 Introduction

Oral health plays an important role in the physical, mental, social, and economic well-being of individuals and communities. The oral cavity and its surrounding structures are an essential

* Corresponding author: tita.ratya@umy.ac.id

part of the human body, inseparable from daily functions and contribute greatly to the overall well-being of individuals.¹ Family environment influences children's dental health through factors like parental oral hygiene supervision, mother's education level, and preventive care acceptance, highlighting the importance of socio-behavioral aspects in oral health.² The mixed dentition period, or the condition where primary teeth and permanent teeth are in the oral cavity simultaneously, will begin around the age of six years, i.e., when the first molar teeth appear and will end around the age of 12 years, where permanent teeth have replaced the primary teeth.³ In this case, parents' knowledge about primary teeth transition to permanent teeth is vital. Parents, therefore, are expected to know when their child's teeth erupt and fall out. The more parents understand about their child's tooth growth, the more they will be able to maintain their child's dental health during the tooth change period.⁴ Parental involvement in monitoring the transition from primary teeth to permanent teeth in children can also help reduce the number of malocclusion sufferers in Indonesia.

Specifically, malocclusion is an irregularity/deviation in the normal position of the teeth, both in the relationship of the upper and lower dental arches in sagittal, vertical, and transverse positions. Malocclusion can be caused by several factors, including genetic factors, poor nutrition, bad habits, excess teeth, dental caries, and premature loss of primary teeth.⁵ Crowded teeth can be characterized by a difference in the width of the teeth compared to the size of the jaw arch and is related to inhibited jaw growth, where when there is a lack of space in the tooth arrangement, the teeth will experience adverse effects in the form of eruption, dislocation (out of place), rotation, and others.⁶ Malocclusion can also be caused by a mismatch between the size of the teeth and jaw, which is common during the dental transition period (between the ages of 6 and 12 years). The dissociation between tooth and jaw size is instigated by genetic and environmental factors, so treating this case is more appropriate during the dental transition period in early adolescence. Premature serial extractions can, in fact, cause undesirable effects, such as shifting towards diastema.⁵

Even though tooth eruption has a long period, to carry out dental treatment at the right time, predicting tooth eruption requires a small period. Data from the World Health Organization indicates that malocclusion is the most important problem in dentistry, after caries and periodontal disease. The prevalence of malocclusion in adolescents in Indonesia remains high, ranging from 90% in 1983 to 89% in 2006, while dental health behavior of adolescents, specifically in relation to malocclusion, persists to be subpar, and the provision of dental health services is not optimum.⁵ Malocclusion, if left unchecked, will cause dental and oral function problems, such as disrupting masticatory function, speaking, aesthetics, and periodontal disease.⁶ In diagnosis and treatment planning in the fields of pediatric dentistry and orthodontics, as well as community medicine to monitor children's growth, adequate knowledge of the timing and sequence of eruption of permanent teeth is an important factor.⁷ Hence, this community service activity aims to increase knowledge by providing education and skills in detecting the transition process from primary teeth to permanent teeth to prevent crowding.

2 Methodology

This community service activity was carried out in collaboration with students of the BEM (Student Executive Board), Faculty of Dentistry (FKG), Universitas Muhammadiyah Yogyakarta (UMY). In the initial stage, coordination was carried out with partners, namely Botokan Hamlet, Sendangrejo, Minggir, Sleman, Yogyakarta. Previously, screening was conducted on 102 residents of Botokan hamlet to determine the condition and classification of malocclusion experienced by the people of Botokan hamlet. Then, tools and materials were prepared to carry out the activities, including educational materials in the form of PPT slides, videos, pocketbooks, and attractive leaflets. Ten questions were given to activity

participants before and after the presentation which were the same questions as indicators of the activity's success (Table 1).

Table 1. Pre-test and post-test questions

| No. | Questions |
|-----|--|
| 1 | One of the causes of crowding of teeth is: |
| | A. It is too late to remove primary teeth that are the time to fall out. |
| | B. Cavity |
| | C. Premature extraction of permanent teeth |
| 2 | If left unchecked, crowded teeth will result in: |
| | A. Dry mouth |
| | B. Teeth get cavities easily. |
| | C. Canker sores appear. |
| 3 | The first primary teeth to emerge are: |
| | A. Central incisors |
| | B. Canine tooth |
| | C. Front molars |
| 4 | The condition where the primary teeth have not fallen out, but the permanent teeth have emerged is called: |
| | A. Dental caries |
| | B. Persistence of teeth |
| | C. Tooth impaction |
| 5 | Primary teeth will begin to become loose and fall out to be replaced by permanent teeth starting at age: |
| | A. 6-7 years old |
| | B. 9-10 years old |
| | C. 11-12 years old |
| 6 | Primary teeth that are loose but not immediately removed can result in: |
| | A. Cavities in permanent teeth |
| | B. Gums always bleed. |
| | C. Permanent teeth grow in the wrong place. |
| 7 | Bad habits that can cause overbite/underbite teeth: |
| | A. Rest on chin |
| | B. Thumb sucking |
| | C. Biting the pencil |
| 8 | Teeth that grow crowded and irregular are called: |
| | A. Malocclusion |
| | B. Caries |
| | C. Gingivitis |
| 9 | Crowded and irregular teeth can be corrected with treatment: |
| | A. Orthodontics |
| | B. Orthopedics |
| | C. Origami |
| 10 | One way to maintain healthy teeth and mouth is: |
| | A. Routinely go to the dentist once a year |
| | B. Brush the teeth vigorously. |
| | C. Brushing the teeth at least twice a day |

After completing the pre-test questions, an explanation was given about how the transition process from primary teeth to permanent teeth causes malposition and malocclusion using PPT media containing slides with interesting pictures and videos to make it easier to understand the material. Aside from that, the participants have been explained the meaning of malocclusion and malposition that can occur in the teeth and the side effects or consequences that can occur in the oral cavity if the teeth experience malocclusion and malposition. Since teeth experiencing malocclusion and malposition can be treated by undergoing orthodontic treatment from an orthodontist, education was given about what is meant by orthodontic treatment and what is meant by an orthodontic specialist (orthodontist). Also, they were given an understanding that the teeth must be kept clean and healthy, including being more thorough in brushing the teeth with malocclusion and malposition because it will be easier for food residue to get stuck and will be more difficult to clean. The activity ended with a discussion, questions and answers session, and working on post-test questions. To make it easier for participants to remember the material presented, leaflets and pocketbooks were distributed (Fig. 1).



Fig. 1. Pocketbook and leaflet

3 Results and Discussion

The results of the screening from 102 residents obtained 36 people with Angle class I malocclusion classification (type 1: 4 people, type 2: 1 person, type 3: 4 people, type 4: 2 people, type 5: 2 people), 8 people Angle class II malocclusion (division 1: 6 people and division 2: 2 people) and 12 people experiencing Angle Class III malocclusion (type 1: 8 people, type 2: 3 people). The rest are difficult to classify because they have lost many teeth and many have teeth with only roots left. These results indicate that the people of Botokan hamlet experience quite high levels of malocclusion and malposition of teeth and have the potential to cause dental and oral health problems. Of the 42 activity participants, the mean pre-test result was 8.19, and the mean post-test result was 9.42 (Table 2).

Table 2. Pre-test and post-test score results

| No. | Pre-Test | Post-Test | Change |
|-----|----------|-----------|--------|
| 1 | 8 | 10 | 2 |
| 2 | 10 | 10 | 0 |
| 3 | 9 | 9 | 0 |
| 4 | 7 | 9 | 2 |

| | | | |
|------|------|------|---|
| 5 | 3 | 8 | 5 |
| 6 | 6 | 10 | 4 |
| 7 | 10 | 10 | 0 |
| 8 | 6 | 10 | 4 |
| 9 | 6 | 9 | 3 |
| 10 | 8 | 9 | 1 |
| 11 | 7 | 10 | 3 |
| 12 | 8 | 10 | 2 |
| 13 | 10 | 10 | 0 |
| 14 | 8 | 7 | 1 |
| 15 | 10 | 10 | 0 |
| 16 | 8 | 6 | 2 |
| 17 | 7 | 9 | 2 |
| 18 | 9 | 10 | 1 |
| 19 | 4 | 7 | 3 |
| 20 | 7 | 8 | 1 |
| 21 | 7 | 10 | 3 |
| 22 | 9 | 10 | 1 |
| 23 | 10 | 10 | 0 |
| 24 | 9 | 10 | 1 |
| 25 | 10 | 10 | 0 |
| 26 | 10 | 10 | 0 |
| 27 | 8 | 10 | 2 |
| 28 | 8 | 10 | 2 |
| 29 | 6 | 10 | 4 |
| 30 | 10 | 9 | 1 |
| 31 | 10 | 10 | 0 |
| 32 | 10 | 10 | 0 |
| 33 | 8 | 10 | 2 |
| 34 | 8 | 10 | 2 |
| 35 | 7 | 10 | 3 |
| 36 | 10 | 10 | 0 |
| 37 | 9 | 10 | 1 |
| 38 | 9 | 9 | 0 |
| 39 | 8 | 9 | 1 |
| 40 | 8 | 9 | 1 |
| 41 | 9 | 9 | 0 |
| 42 | 10 | 10 | 0 |
| Mean | 8.19 | 9.42 | |

The t-test results obtained revealed significant differences. Thus, it can be concluded that this activity effectively increased knowledge and skills regarding dental health, especially the transition process from primary teeth to permanent teeth (Fig. 2.).

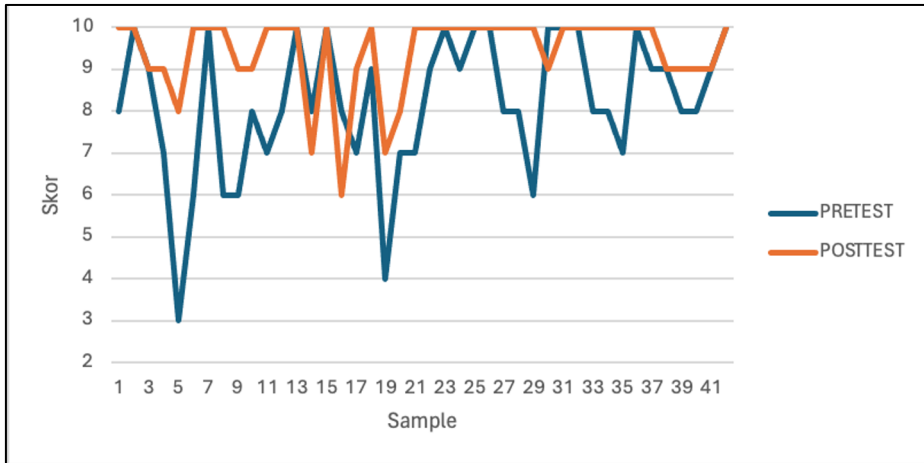


Fig. 2. T-test results

Because the t-test value or P-value obtained is less than the significance level (α), hypothesis 0 is rejected, and it is concluded that there is a significant difference between the pre-test and post-test scores.

T-TEST 0.000006969 < 0.05

The results in Table 2 exhibit an increase in pre-and post-test results. Also, the t-test results in Graph 1 illustrate a significant difference. This indicates that efforts to increase knowledge and skills in detecting the transition process from primary teeth to permanent teeth to prevent tooth crowding (malocclusion) in the people of Botokan Hamlet have been successful. Presentation using PPT slides with interesting videos has proven to be effective in increasing public knowledge. Audiovisual media is educational, visually interesting, easy to watch, and not boring. Apart from that, this media can improve brain abilities and sharpen memory through messages conveyed verbally and non-verbally.⁸ Audiovisual aids provide a multisensory experience, engaging learners through both visual and auditory stimuli. This multisensory approach can improve memory retention by triggering multiple senses, which are more effective in processing and storing information in long-term memory.⁹

Providing education regarding the detection of the transition process from primary teeth to permanent teeth to prevent crowding is an important thing to do. Studies suggest that the prediction of tooth eruption time is highly useful in interceptive occlusion guidance, particularly for determining primary tooth extraction and orthodontic treatment time, and it is important to know the normal tooth eruption time in a population.⁷ Malocclusion not only causes physical pain but also disrupts the quality of life of adolescents overall related to psychological and social development.⁵ Community empowerment programs have been successful in enhancing parents' knowledge about preventive orthodontic treatments, which is crucial for early diagnosis and intervention to prevent malocclusion.¹⁰ Audio-visual aids help parents understand complex oral health issues, such as malocclusion, by using visual aids and animations to explain the problems and their etiology. This makes it easier for parents to grasp the concepts and their implications.¹¹

After the counseling activity was completed, a discussion was continued regarding the process of changing primary teeth to permanent teeth and its effects on malocclusion. In this session, quite a lot of parents asked questions. Encouraging parental involvement in the education process by involving them in the interactive sessions and activities. This helps to reinforce the learning and ensures that parents are aware of the importance of preventive orthodontic treatments.¹² Using visual aids such as educational films, videos, and animations to make the educational content more engaging and easier to understand for children and parent.¹³

The results obtained showed that the majority of the Botokan community experienced Angle class I malocclusion with malpositioned teeth. Crowding and overlapping teeth can make it challenging to clean the teeth effectively, leading to increased plaque accumulation and a higher risk of dental caries and periodontal disease.¹⁴ Malocclusion can negatively affect the health of the periodontium, leading to issues such as tooth wear, sensitivity, and fractures. Poor oral hygiene and parafunctional habits like bruxism can exacerbate these problems.¹⁵ The aesthetic impact of malocclusion, particularly on the appearance of the teeth, can significantly influence self-esteem. Individuals who are less satisfied with their dental appearance tend to have lower self-esteem.¹⁶ With increased knowledge, it is expected that teenagers and parents will have the ability to monitor the process of changing teeth, thus preventing the crowding of teeth from growing. Teeth that grow in good alignment will make it easier to clean and easier to maintain healthy teeth and mouth.

4 Conclusions

A substantial improvement has been experienced by the Botokan Hamlet community in their understanding and skills to identify the transition from primary teeth to permanent teeth, with the aim of preventing tooth crowding. The parents' knowledge about children's tooth growth and their ability to monitor the process of tooth change will greatly contribute to the dental health of the children, resulting in significant advantages. Proper alignment and healthy, developing teeth facilitate easier cleaning, thus reducing the likelihood of unanticipated tooth decay.

Acknowledgements

The authors would like to thank Universitas Muhammadiyah Yogyakarta through the Community Empowerment Institute, which has provided material and immaterial support, and to thank the students of BEM FKG UMY 2023/2024 Academic Year who have helped with the process of implementing the activities.

References

1. Oral Health in America: Advances and Challenges [Internet]. Bethesda (MD): National Institute of Dental and Craniofacial Research(US); Effect of Oral Health on the Community, Overall Well-Being, and the Economy Dec. Section 1 (2021)
2. Aurelia, Spinei. The relationship between socio-behavioural factors in family environment and dental caries development in children. *Medicina stomatologică*, doi: 10.53530/1857-1328.22.61.08 (2023)
3. S.N. Stoica, V. Nimigean, M.J.R. Vîrlan, and V.R. Nimigean, "The Pathology of the First Permanent Molar during the Mixed Dentition Stage—Review," *Appl. Sci.* **13**(1), 483 (2022)

4. J. Vittoba Setty, I. Srinivasan. Knowledge and Awareness of Primary Teeth and Their Importance among Parents in Bengaluru City, India. *Int J Clin Pediatr Dent.* 9 (1):56-61 (2016)
5. I. Djaharu'ddin, "Prediction Formula of Permanent Canine and Premolar Eruption in Mixed Dentition Patients at Universitas Airlangga, Dental Hospital Surabaya, Indonesia.," *Contemp. Clin. Dent.* **10**(1), 105–109 (2019)
6. P.J. Das, W. Dkhar, and A. Pradhan, "An Evaluation of Dental Crowding in Relation to the Mesiodistal Crown Widths and Arch Dimensions in Southern Indian Population," *J. Clin. DIAGNOSTIC Res.* **11**(9), (2017)
7. A. Fekonja, "Evaluation of the eruption of permanent teeth and their association with malocclusion.," *Clin. Exp. Dent. Res.* **8**(4), 836–842 (2022)
8. Ernita, Yuli & Mayar, Farida. The Influence of Audio Visual Media With Animated Films on Children's Speaking Skills in Kindergarten. *AL-ISHLAH: Jurnal Pendidikan.* 15. 10.35445/alishlah.v15i4.3767 (2023)
9. D. Regina & W. Rajasekaran, A Study on Understanding the Effectiveness of Audiovisual Aids in Improving English Vocabulary in ESL Classrooms. *World Journal of English Language.* 13. 446. 10.5430/wjel.v13n8p446 (2023)
10. Nugraha, Alexander & Narmada, IB & Tengku Ahmad Noor, Tengku Natasha Eleena.. Knowledge Enhancement about Preventive Orthodontic Treatment for Malocclusion and Stunting in Elementary School Children after Community Empowerment. *Indonesian Journal of Dental Medicine.* 6. 66-69. 10.20473/ijdm.v6i2.2023.66-69 (2023)
11. Chandra, Shivangi & Singal, Deepa & Arora, Satyaki & Dwivedi, Swati Dwivedi & Kiran, Komal & Nikhra, Varun & N. Chandra., Audio-Visual Aid: An Effective Means to improve Parental Awareness toward Habits and Malocclusion Prevention in Children. *World Journal of Dentistry.* 5. 98-101. 10.5005/jp-journals-10015-1267 (2014)
12. X. Rozela, R. Milton, Preventive and Interceptive Orthodontics Treatment. *European Journal of Medicine and Natural Sciences,* 5(1), 26-31(2022)
13. Jahanbin, Amin & Haghifar, Monireh & Shahamfar, Mohamadreza. Effect of various educational methods on increasing parents' awareness of their children's preventive orthodontic treatments. *Brazilian Journal of Oral Sciences.* 23. e240396. 10.20396/bjos.v23i00.8670396 (2024)
14. K.A. Kolawole, M.O. Folayan, Association between malocclusion, caries and oral hygiene in children 6 to 12 years old resident in suburban Nigeria. *BMC Oral Health.* 19(1):262. doi: 10.1186/s12903-019-0959-2. PMID: 31775712; PMCID: PMC6882329 (2019)
15. I. Chu, D. Kennedy, P. Hatzimanolakis, Knowledge of malocclusion supports comprehensive dental hygiene care. *Can J Dent Hyg.* 53(2):118-124. PMID: 33240349; PMCID: PMC7533816 (2019)
16. Mathew, Thomas, Dental Malocclusion among University Students and Its Effect on Self-esteem: A Cross-sectional Study. *World journal of DENTISTRY.* 5. 204-208 (2014)